

WHAT IS CLAIMED IS:

1. A method for preparing organic silicate polymer, comprising:
mixing silane compound with organic solvent to form a first mixture, the silane compound being selected from a group consisting of:
 - 5 a) oxidized hydrosilane;
 - b) cyclic siloxane;
 - c) a second mixture of oxidized hydrosilane and silane or silane oligomer; and
 - d) a third mixture of cyclic siloxane and silane or silane oligomer; andhydrolyzing and condensing the first mixture by adding water and catalyst.
- 10 2. The method according to Claim 1, wherein the oxidized hydrosilane of a) is prepared by preparing hydrosilane compound and oxidizing the hydrosilane compound in the presence of water or alcohol.
- 15 3. The method according to Claim 2, wherein the hydrosilane compound is hydrosilane oligomer represented by the following Chemical Formula 1 or cyclic hydrosilane oligomer represented by the following Chemical Formula 2:

[Chemical Formula 1]

$$R^1_nSi(OSi)_mH_{(2m-n+4)}$$

, wherein:

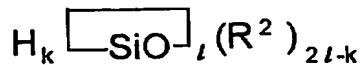
R^1 is hydrogen, fluorine, aryl, vinyl, allyl, or linear or branched C_{1-4} alkyl

20 substituted or unsubstituted with fluorine;

m is independently an integer of 1 to 20; and

n is independently an integer of 1 to 20; and

[Chemical Formula 2]



, wherein:

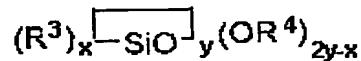
5 R² is hydrogen, fluorine, aryl, vinyl, allyl, or linear or branched C₁₋₄ alkyl substituted or unsubstituted with fluorine; and

k and l are independently an integer of 3 to 10.

4. The method according to Claim 2, wherein oxidizing the hydrosilane compound is carried out by adding at least one the catalyst or a peroxide oxidizing agent, 10 the catalyst being selected from a group consisting of Pd, Pt and Rh.

5. The method according to Claim 1, wherein the cyclic siloxane of b) is a compound represented by the following Chemical Formula 3:

[Chemical Formula 3]



15 , wherein:

R³ is hydrogen, fluorine, aryl, vinyl, allyl, or linear or branched C₁₋₄ alkyl substituted or unsubstituted with fluorine;

R⁴ is hydrogen or linear or branched C₁₋₄ alkyl; and

x and y are independently an integer of 3 to 10.

20 6. The method according to Claim 1, wherein the silane or silane oligomer of c) and d) comprises silicon, oxygen, carbon and hydrogen.

7. The method according to Claim 1, wherein the silane or silane oligomer of c) and d) is a silane compound represented by the following Chemical Formula 4 or Chemical Formula 5:

[Chemical Formula 4]

5 $\text{SiR}_p^5\text{R}_{4-p}^6$

, wherein:

R^5 is hydrogen, aryl, vinyl, allyl, or linear or branched C_{1-4} alkyl substituted or unsubstituted with fluorine;

R^6 is acetoxy, hydroxy, or linear or branched C_{1-4} alkoxy; and

10 P is independently an integer of 0 to 2;

[Chemical Formula 5]

$\text{R}_q^7\text{R}_{3-q}^8\text{Si-M-SiR}_r^9\text{R}_{3-r}^{10}$

, wherein:

R^7 and R^9 are hydrogen, aryl, vinyl, allyl, or linear or branched C_{1-4} alkyl

15 substituted or unsubstituted with fluorine, respectively;

R^8 and R^{10} are acetoxy, hydroxy, or linear or branched C_{1-4} alkoxy, respectively;

M is C_{1-6} alkylene or phenylene; and

q and r are independently an integer of 0 to 2.

8. The method according to Claim 1, wherein an amount of the catalyst is
20 between about 0.000001 mol to about 2 mol, based on about 1 mol of the silane compound.

9. The method according to Claim 1, wherein hybridizing and condensing the first mixture are performed at a temperature of about 15°C to about 80°C.

10. An organic silicate polymer prepared by the method of Claim 1.

11. A composition for forming an insulation film of a semiconductor device,

5 comprising:

organic silicate polymer and organic solvent,

the organic silicate polymer being prepared by mixing silane compound with the organic solvent to prepare a first mixture and hydrolyzing and condensing the first mixture by adding water and catalyst, the silane compound being selected from a group

10 consisting of :

i) oxidized hydrosilane;

ii) cyclic siloxane;

iii) a second mixture of oxidized hydrosilane and silane or silane oligomer;

and

15 iv) a third mixture of cyclic siloxane and silane or silane oligomer.

12. The composition for forming an insulation film according to Claim 11, further

comprising one or more additives selected from a group consisting of organic molecules, organic polymers, organic dendrimers, pH adjuster, colloidal organic silica and surfactant.

20 13. A method for preparing an insulation film of a semiconductor device, comprising:

a) mixing silane compound with organic solvent to prepare a first mixture and hydrolyzing and condensing the first mixture by adding water and catalyst to obtain an organic silicate polymer, the silane compound being selected from a group consisting of:

i) oxidized hydrosilane;

5 ii) cyclic siloxane;

iii) a second mixture of oxidized hydrosilane and silane or silane oligomer;

and

iv) a third mixture of cyclic siloxane and silane or silane oligomer;

b) dissolving the organic silicate polymer in solvent;

10 c) coating the dissolved organic silicate polymer on a substrate of a semiconductor device; and

d) drying and hardening the coated insulation film.

14. The composition according to Claim 13, wherein coating the dissolved organic silicate polymer is performed by a spin coating, a dipping, a roll coating or a 15 spraying.

15. The composition according to Claim 13, wherein drying the coated insulation film is carried out at a temperature of about 30°C to about 350°C, and hardening the coated insulation film is carried out at a temperature of about 350°C to about 500°C.

16. An insulation film of a semiconductor device prepared by the method of

20 Claim 13.

17. The insulation film according to Claim 16, wherein the insulation film has a

thickness of about 0.05 μm to about 2 μm .

18. A semiconductor device that comprises the insulation film prepared by the method of Claim 13.